Software For Tracking Low Orbit Satellites

Orbitron

Ham Radio Deluxe

Satélite Tracker

(iPhone/iPod App)

Overview

- Amateurs have been building satellites since the earliest days of space travel.
- These satellites are known as "OSCARs"—Orbiting Satellite Carrying Amateur Radio.
- The first Amateur Radio satellite was OSCAR 1 and it reached orbit in 1961

Satellite Orbits

- Most Amateur Radio satellites travel in low Earth orbits at altitudes of 500to 950 mi.
- At this altitude, a satellite completes one orbit every 90 to 100 minutes.
- At the same time, the Earth is turning beneath the satellite.
- The result is that all stations on the ground will enjoy several 15-minute communication sessions with each satellite each day.

Station Equipment

- **Because of the low orbits and sensitive receivers, many Amateur Radio satellites can be used with simple equipment**

Tracking Programs

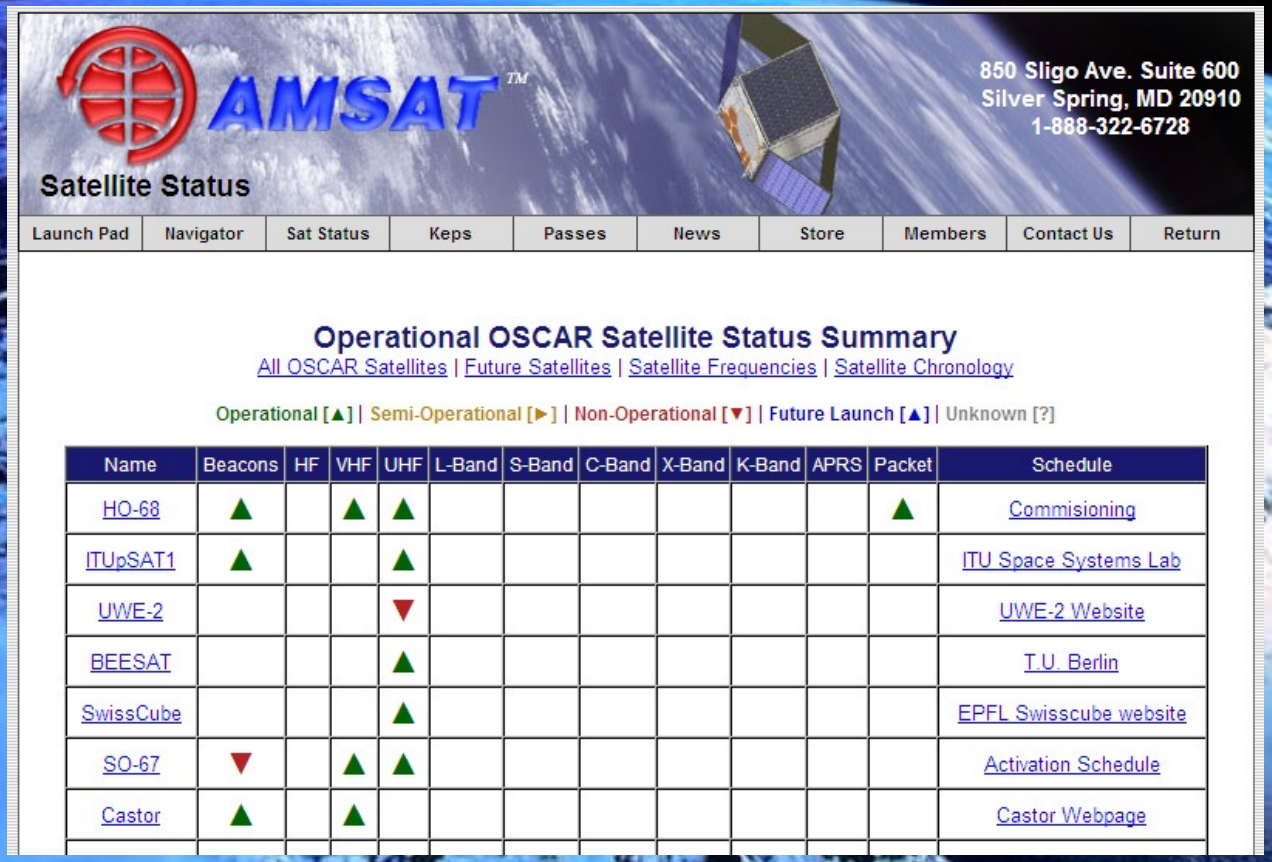
- **A Tracking Program Utilizes Keplerian Data to Compute the Position and Velocity of a satellite for any given time:**
  - **Antenna aiming for azimuth and elevation**
  - **Doppler Shift Correction Based Upon Relative Velocity of the satellite to the Observer**

- **Future predictions of when a ground station will be in view of a satellite**

Keplerian Data

- "Keps" are the variables which describe a Satellite's Orbit
- Keps are developed by NORAD/NASA
  - AMSAT provides reformatted data
- Keps are distributed worldwide
  - Packet Bulletin Boards
  - BBS (DRIG, NASA, AMSAT BBS's
  - Web Sites (www.amsat.org)
  - Automatic e-mail receipt from
  - keps@amsat.org
  - Publications (AMSAT Journal, OSR)

Which Satellites Are Active?



AMSAT™

850 Sligo Ave. Suite 600
Silver Spring, MD 20910
1-888-322-6728

Satellite Status

Launch Pad | Navigator | Sat Status | Keps | Passes | News | Store | Members | Contact Us | Return

Operational OSCAR Satellite Status Summary

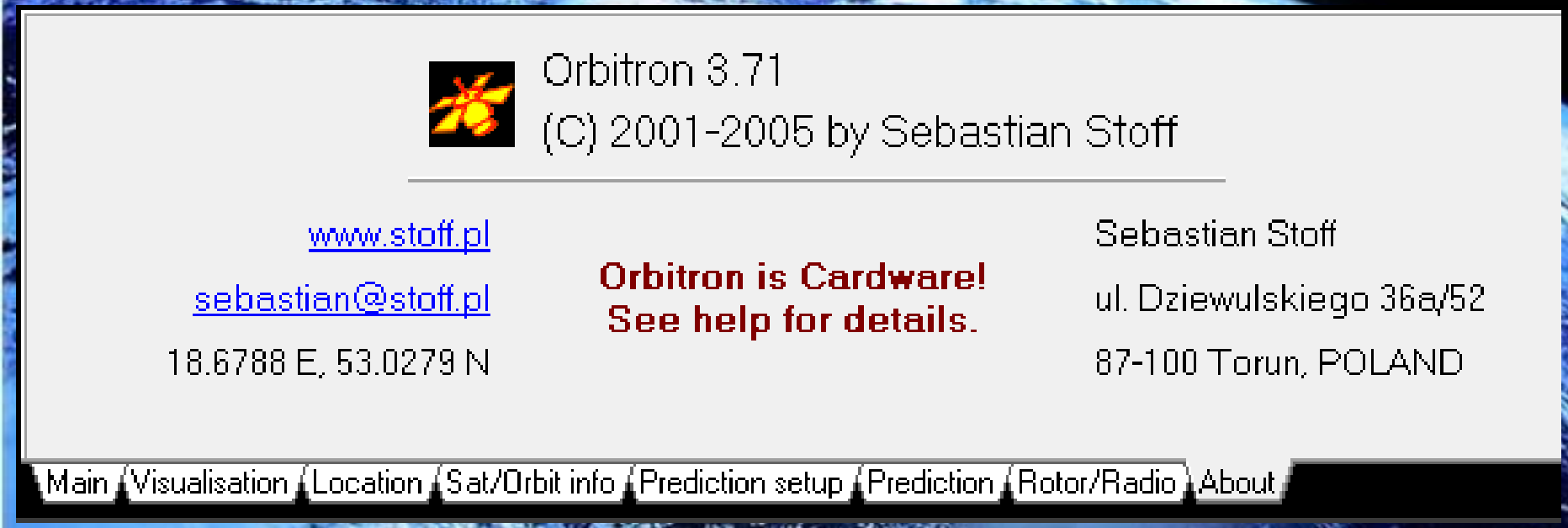
All OSCAR Satellites | Future Satellites | Satellite Frequencies | Satellite Chronology

Operational [▲] | Semi-Operational [►] | Non-Operational [▼] | Future Launch [▲] | Unknown [?]

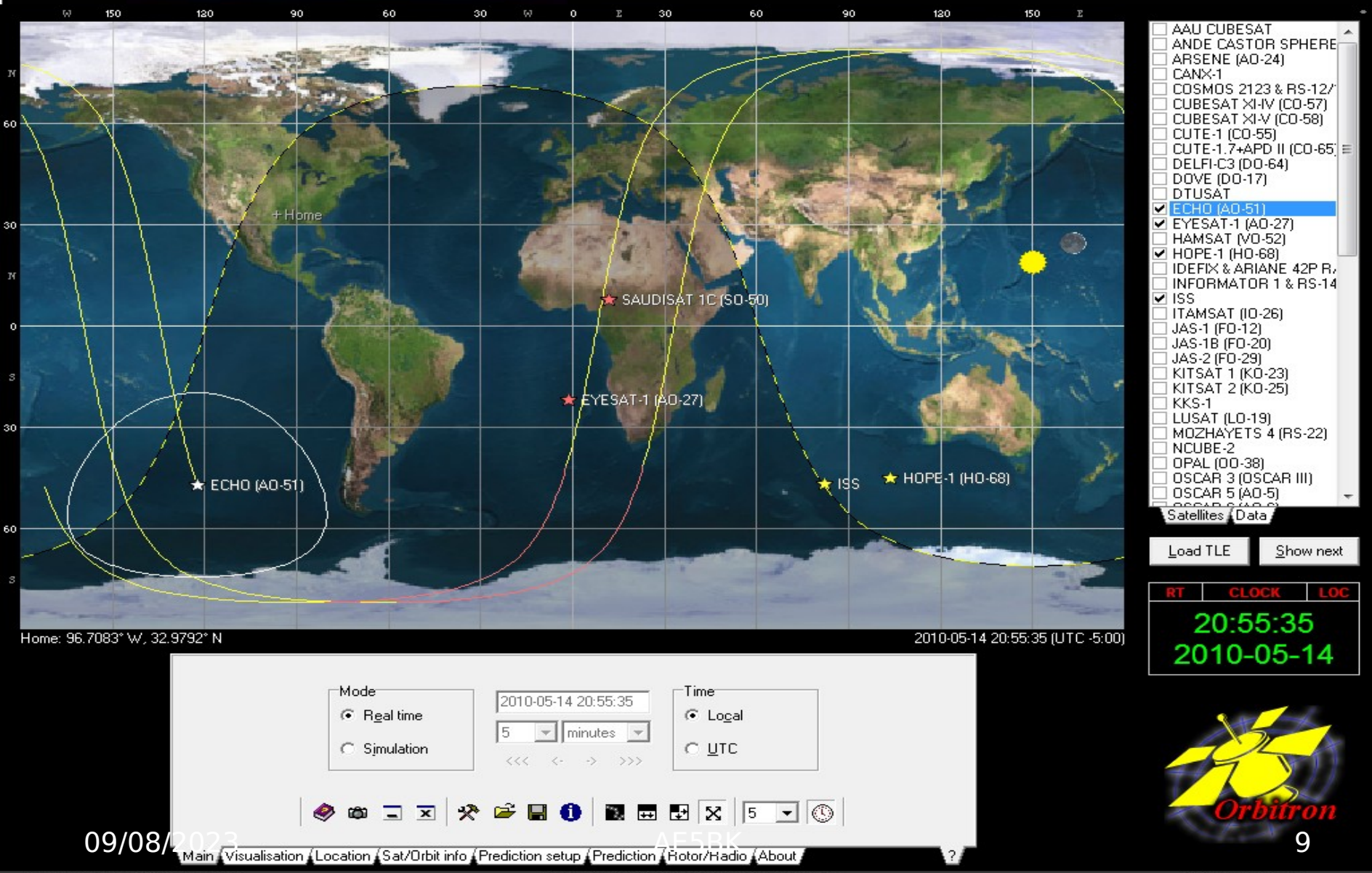
Name	Beacons	HF	VHF	UHF	L-Band	S-Band	C-Band	X-Band	K-Band	APRS	Packet	Schedule
HO-68	▲		▲	▲							▲	Commisioning
ITUpSAT1	▲			▲								ITU Space Systems Lab
UWE-2				▼								UWE-2 Website
BEESAT				▲								T.U. Berlin
SwissCube				▲								EPFL Swisscube website
SO-67	▼		▲	▲								Activation Schedule
Castor	▲		▲									Castor Webpage

http://www.amsat.org/amsat-new/satellites/status.php

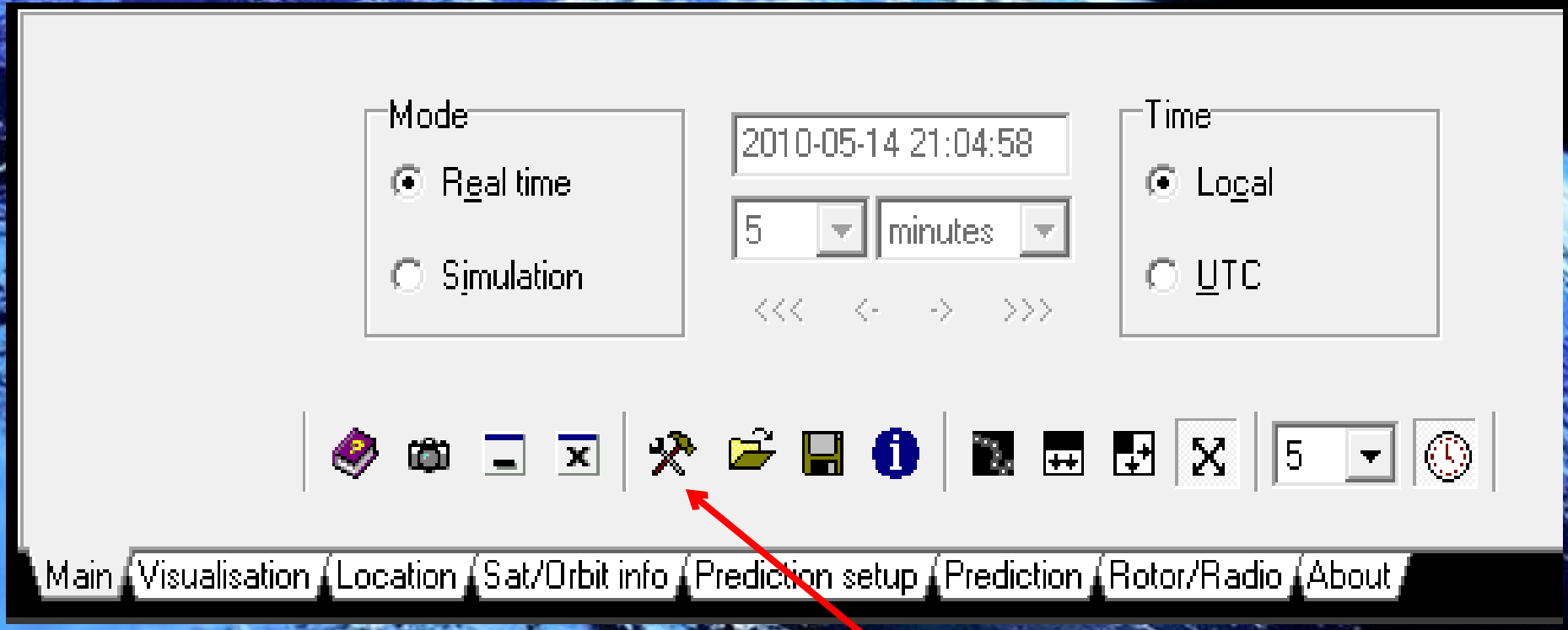
Orbitron 3.71



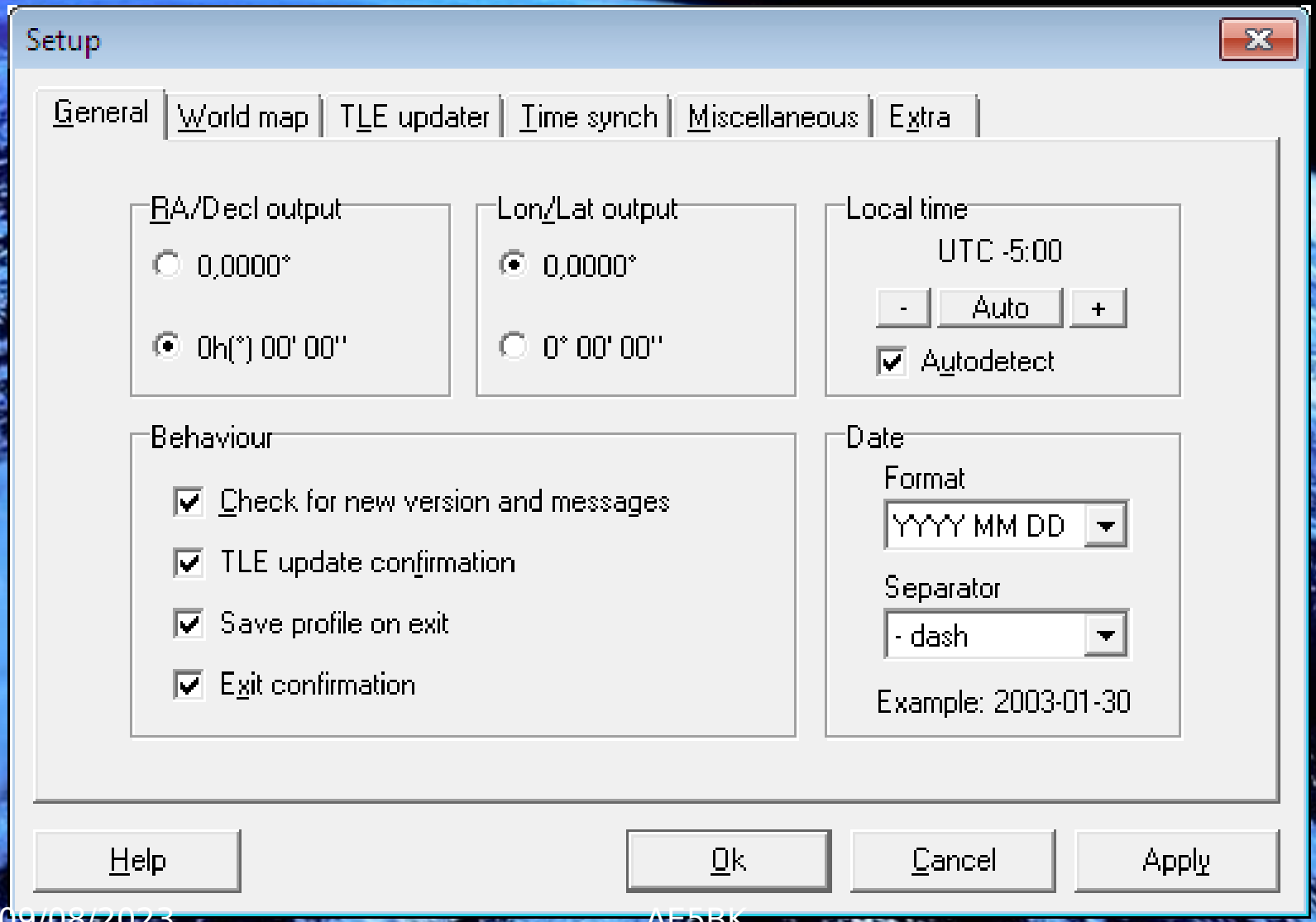
Main Viewing Screen



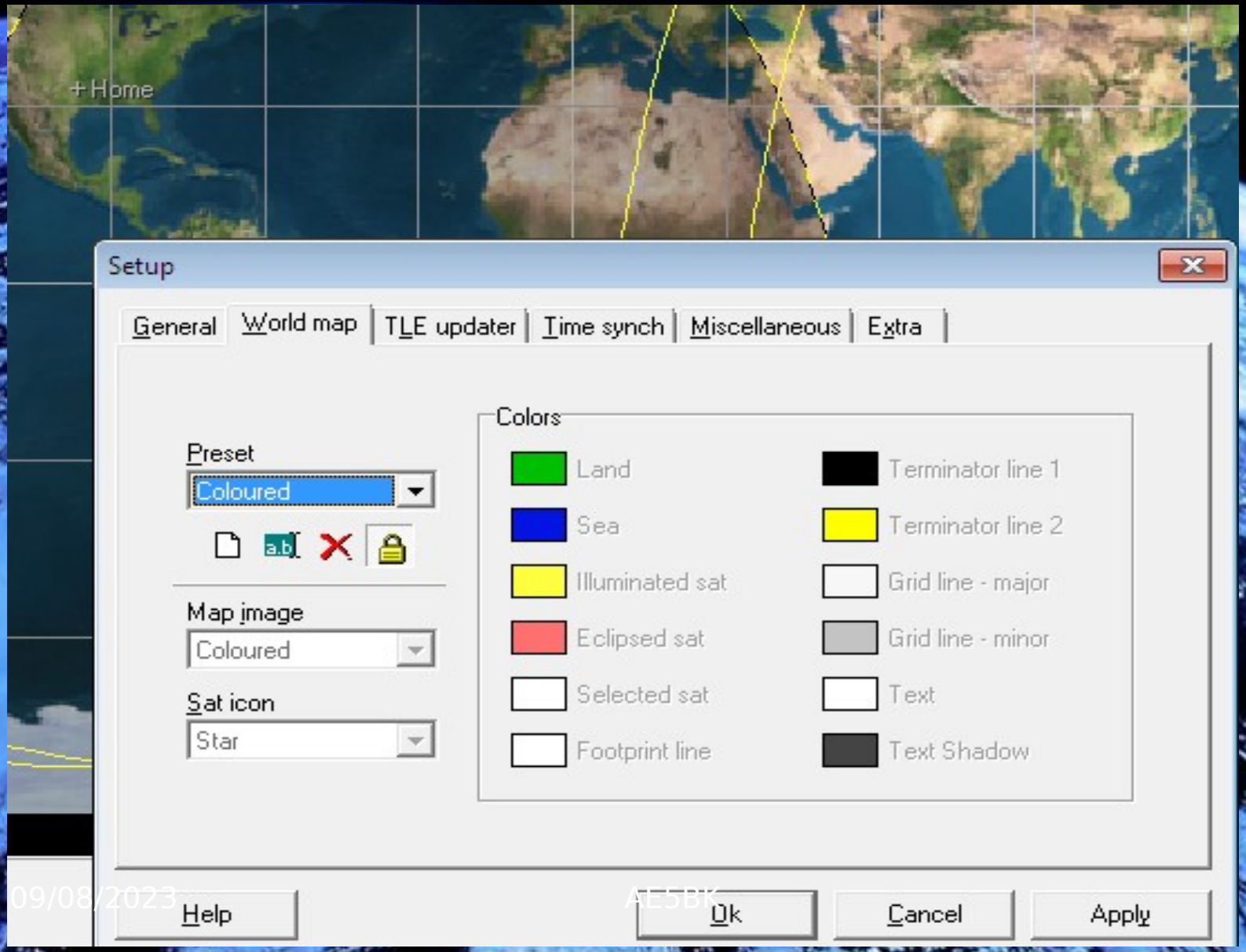
Main Control Panel



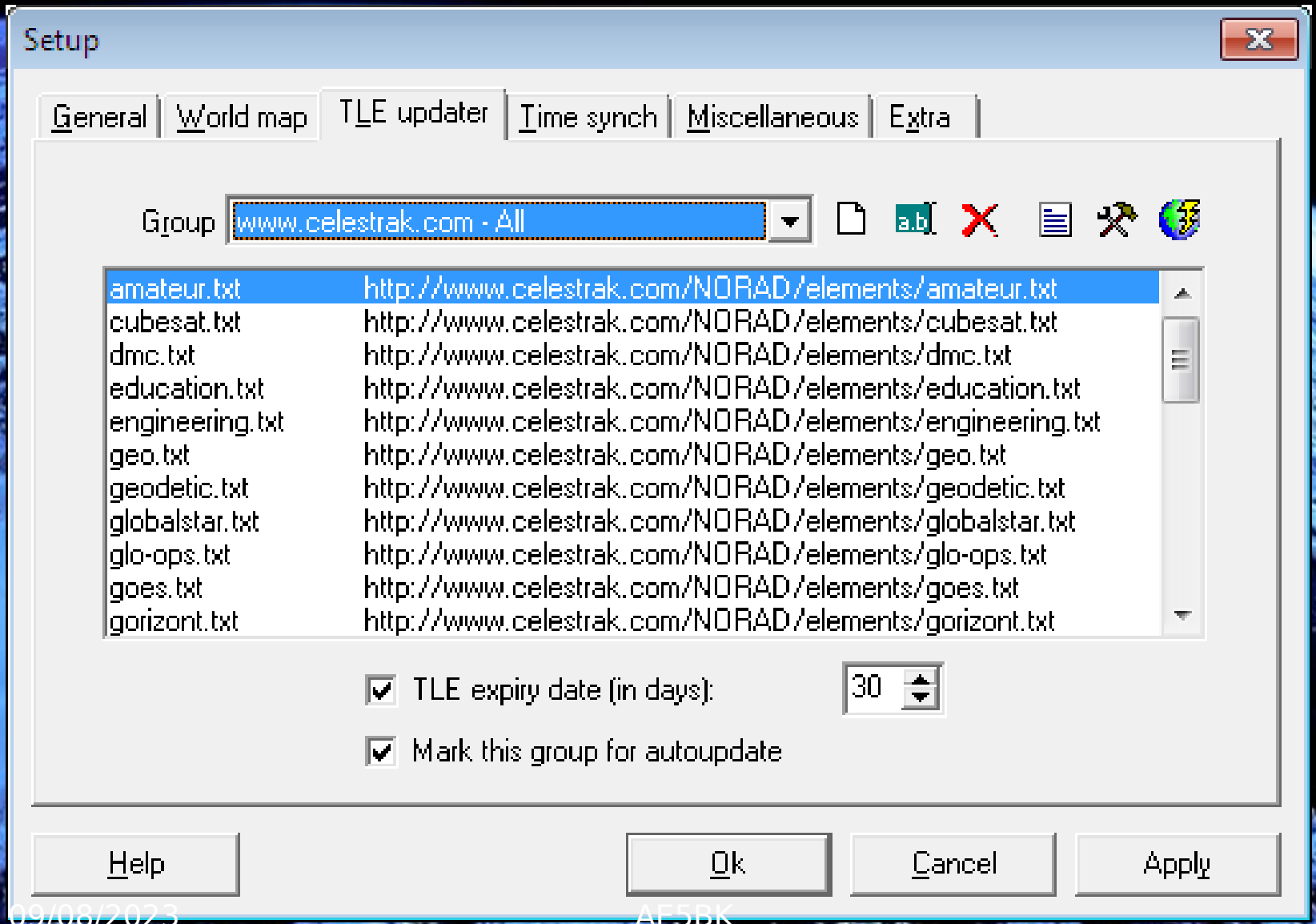
Setup Window (General)



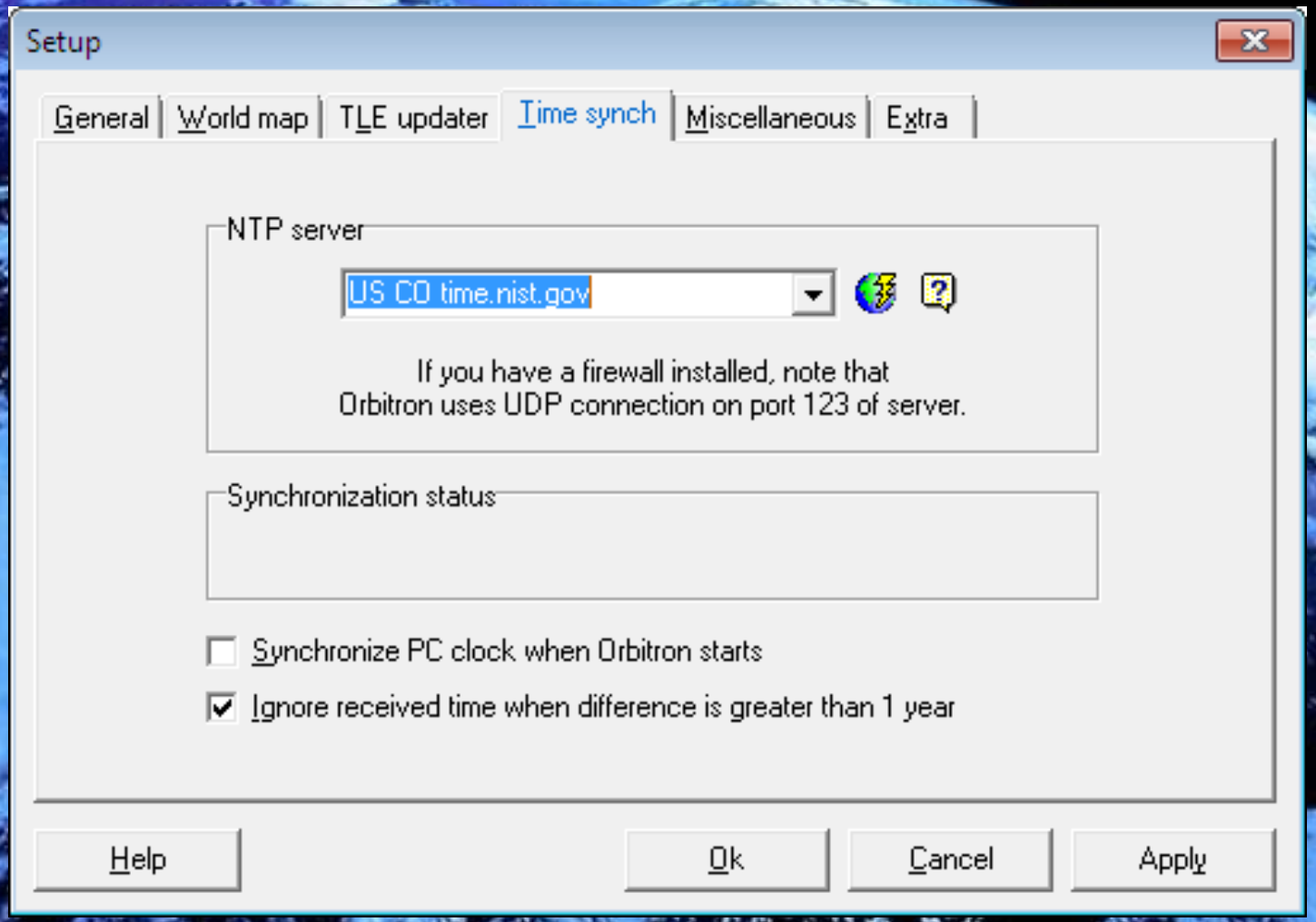
Setup Window (World Map)



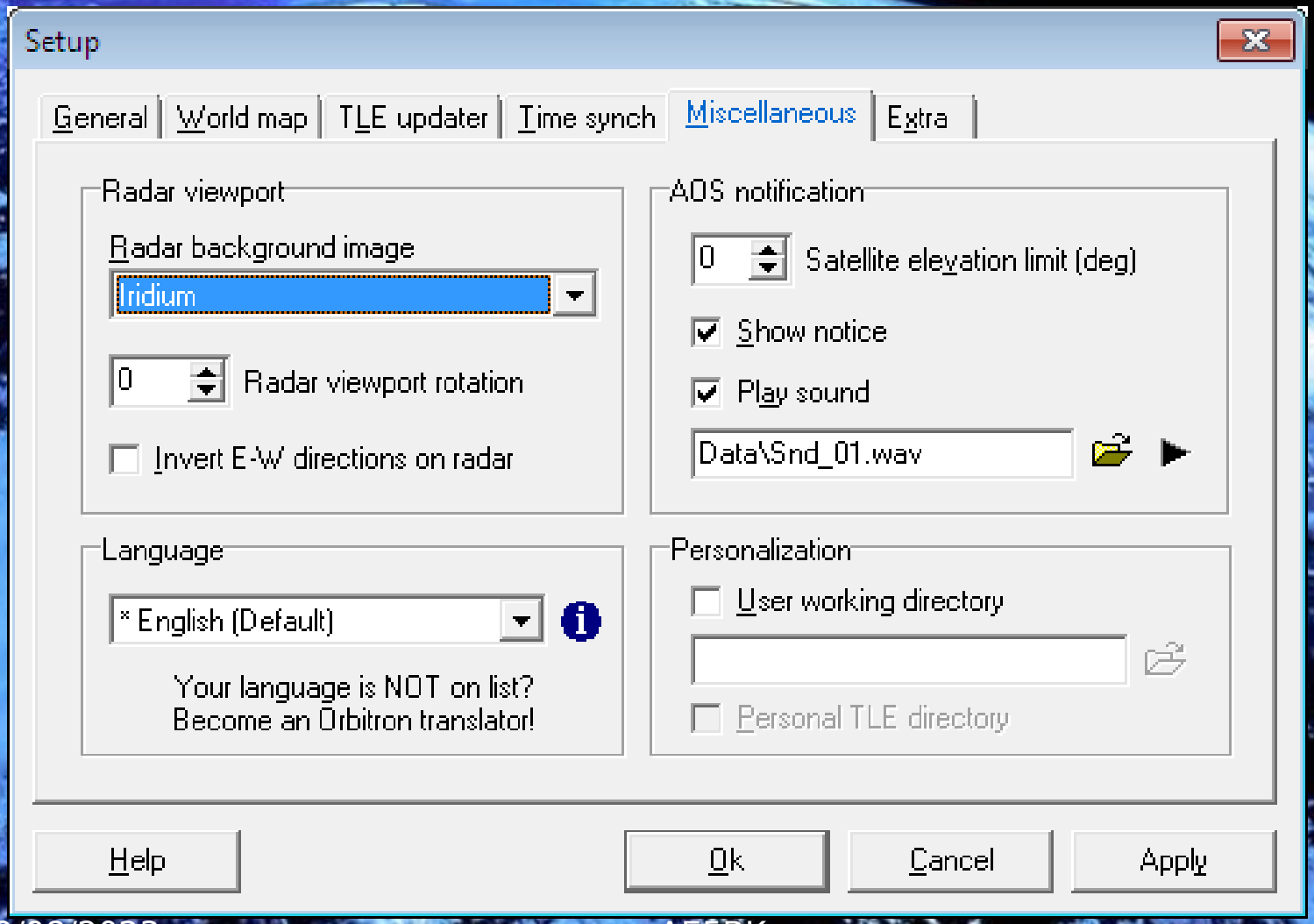
Setup Window (TLE Location)



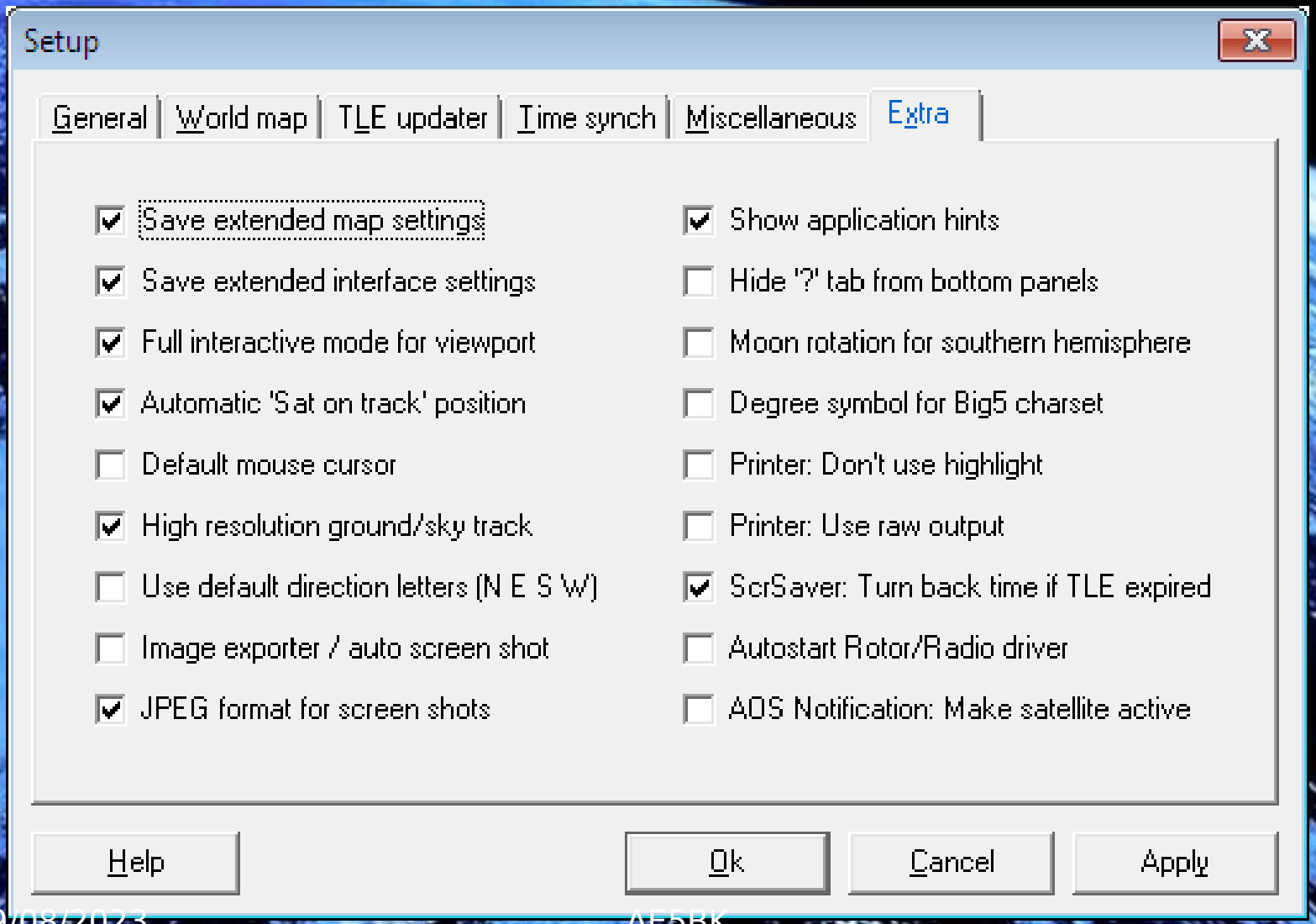
Setup Window (Time Sync)



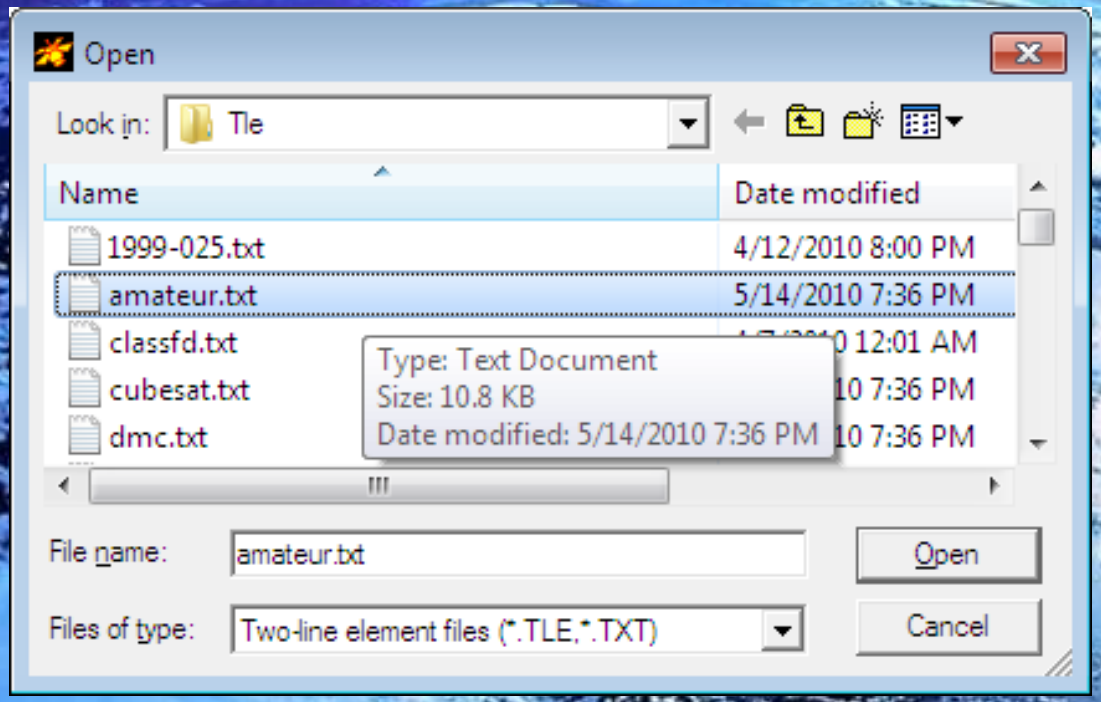
Setup Window (Misc)

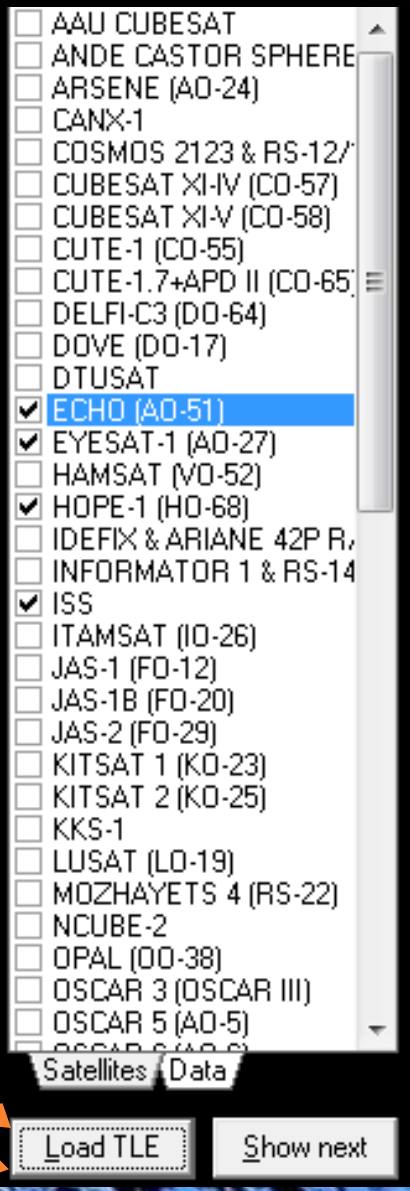


Setup Window (Extra)



Satellite Setup

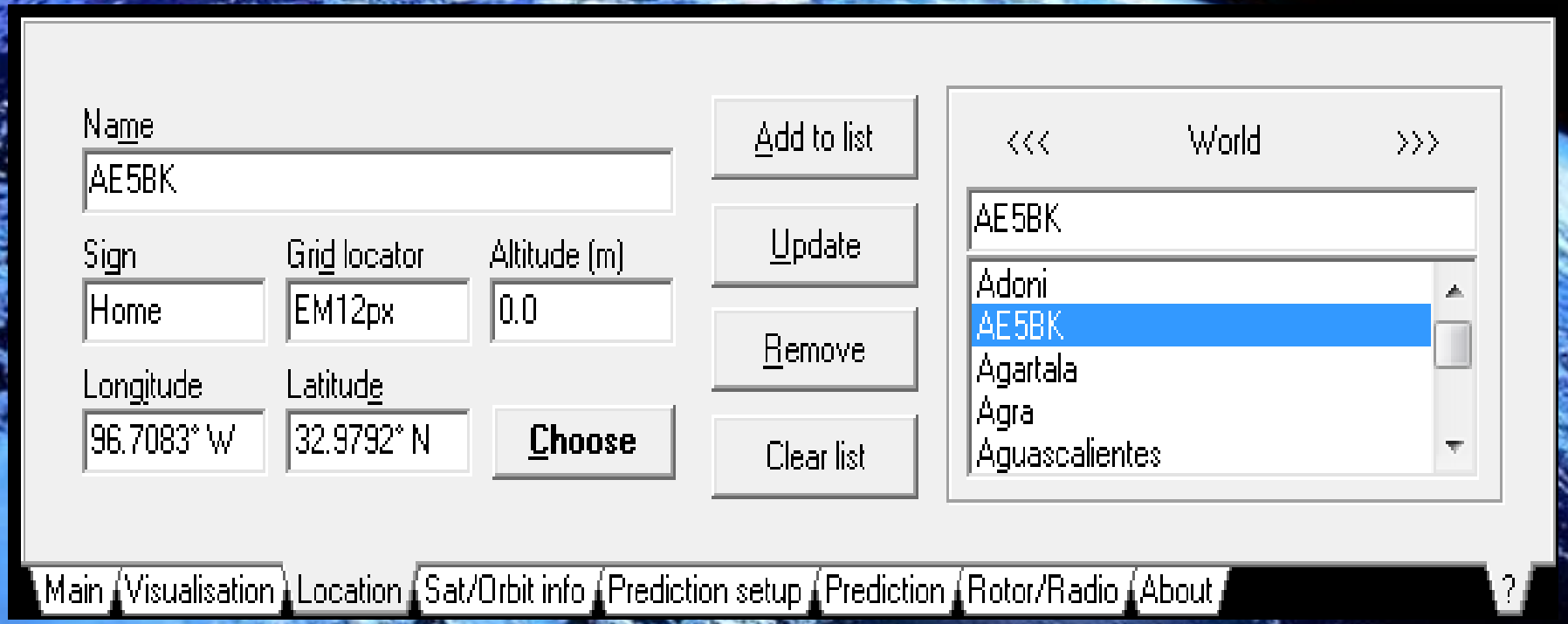




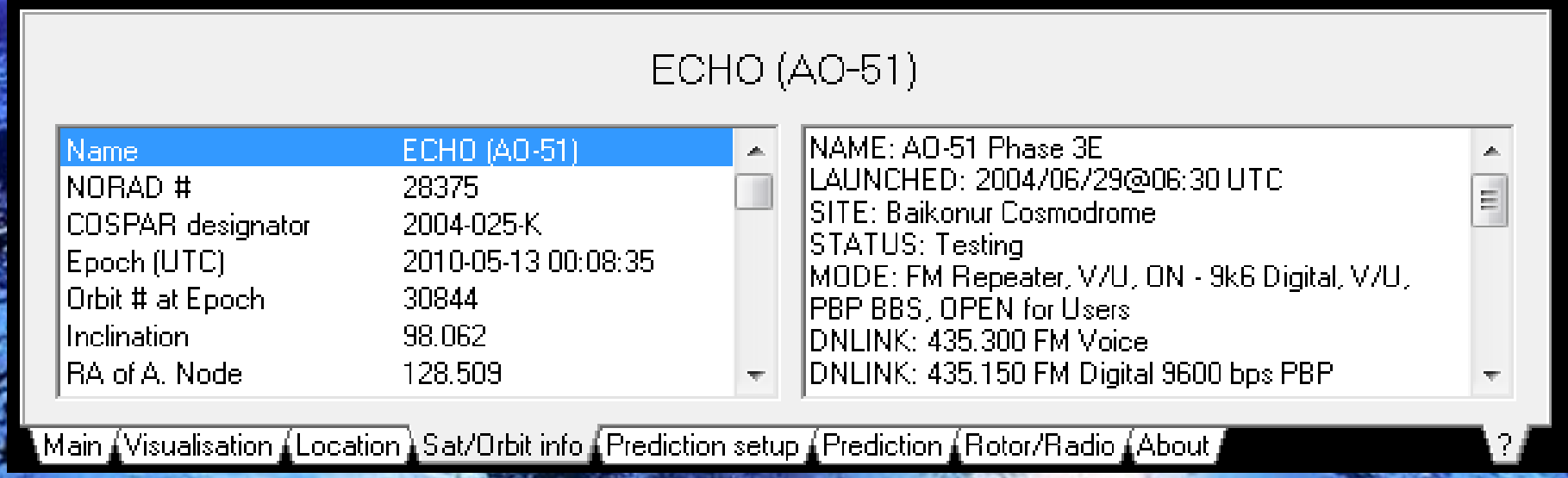
Two Line Element

Foot Print & Radar View

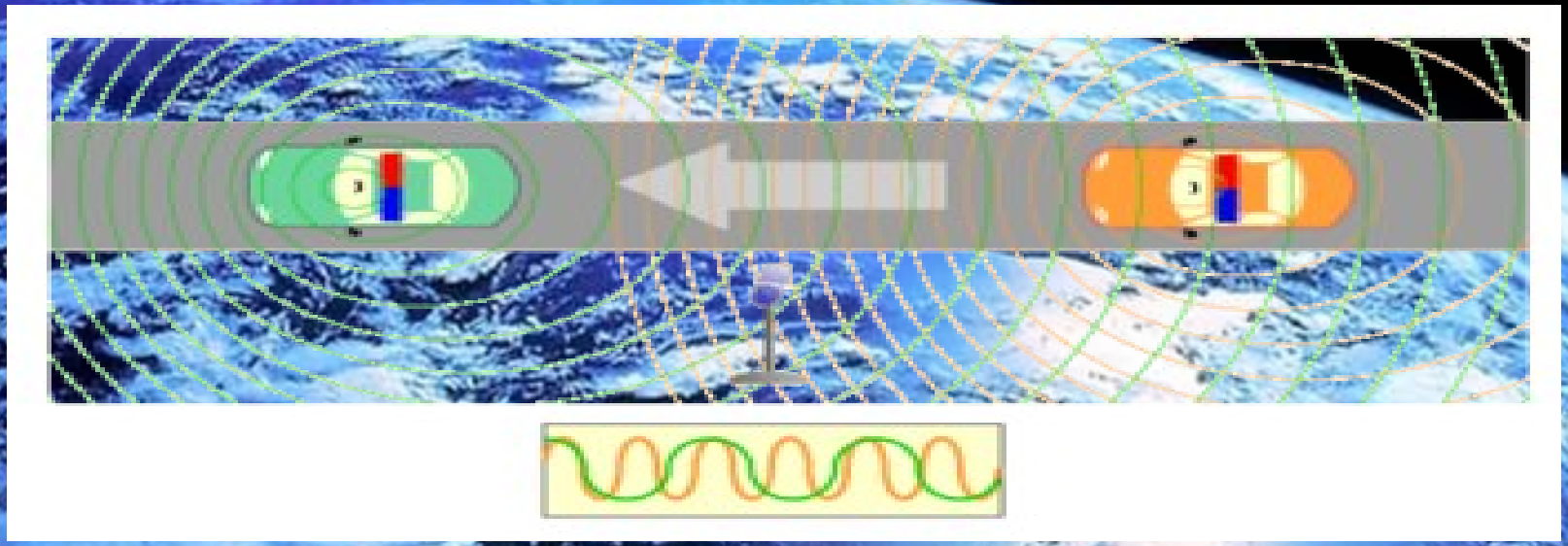
Location Tab



Sat/Orbit Information Tab



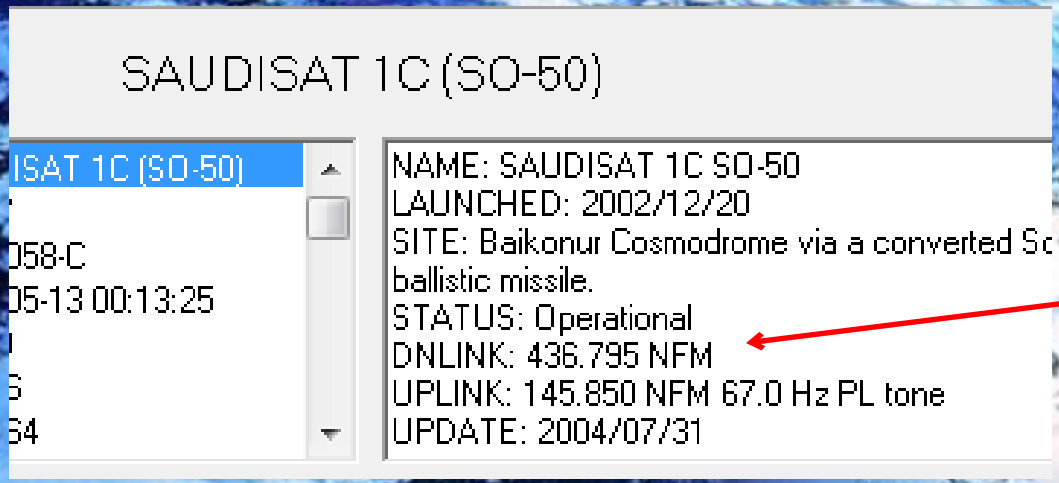
Doppler Effect



A stationary microphone records moving police sirens at different pitches depending on their relative direction.

Doppler Effect

What does that mean for us?

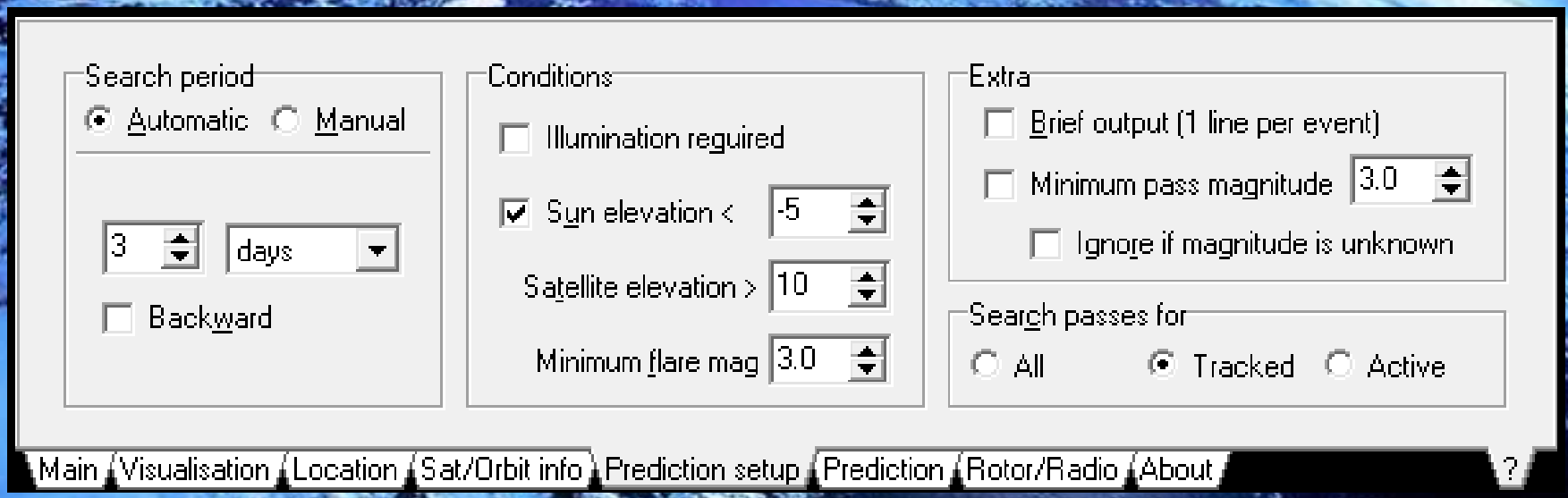


Transmitted Frequency

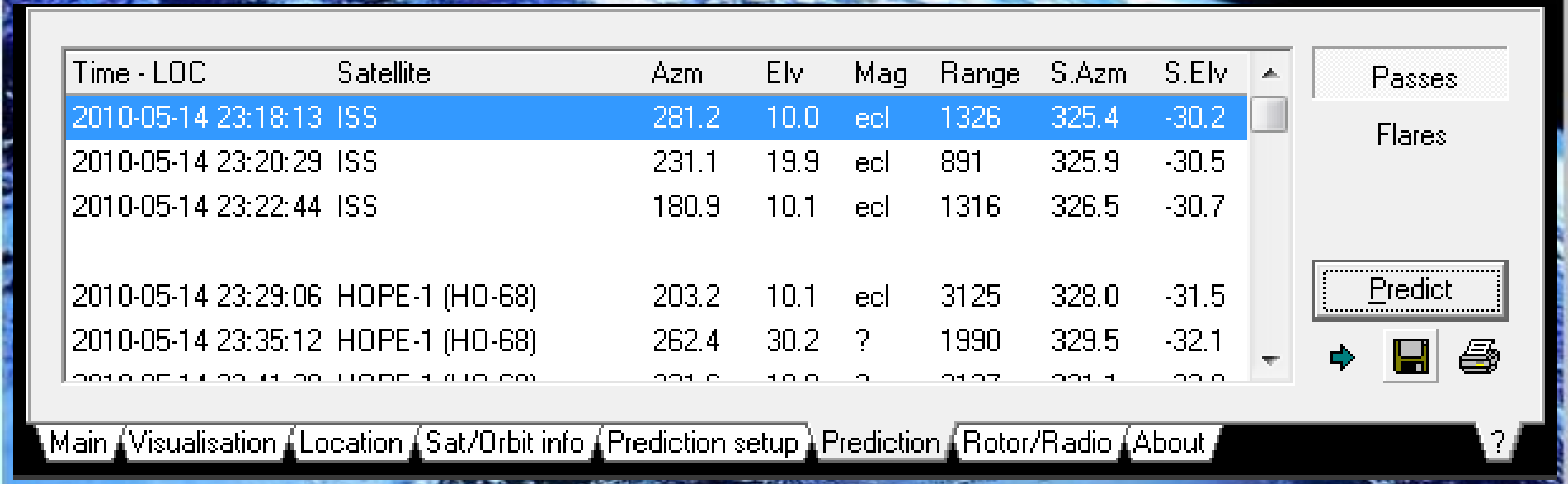
Enter 5 Memory Locations for Downlink

#1 = 436.805 (Up 10 KHz)
#2 = 436.800 (Up 5 KHz)
#3 = 436.795 (Transmitted Frequency)
#4 = 436.790 (Down 5 KHz)
#5 = 436.785 (Down 10 KHz)

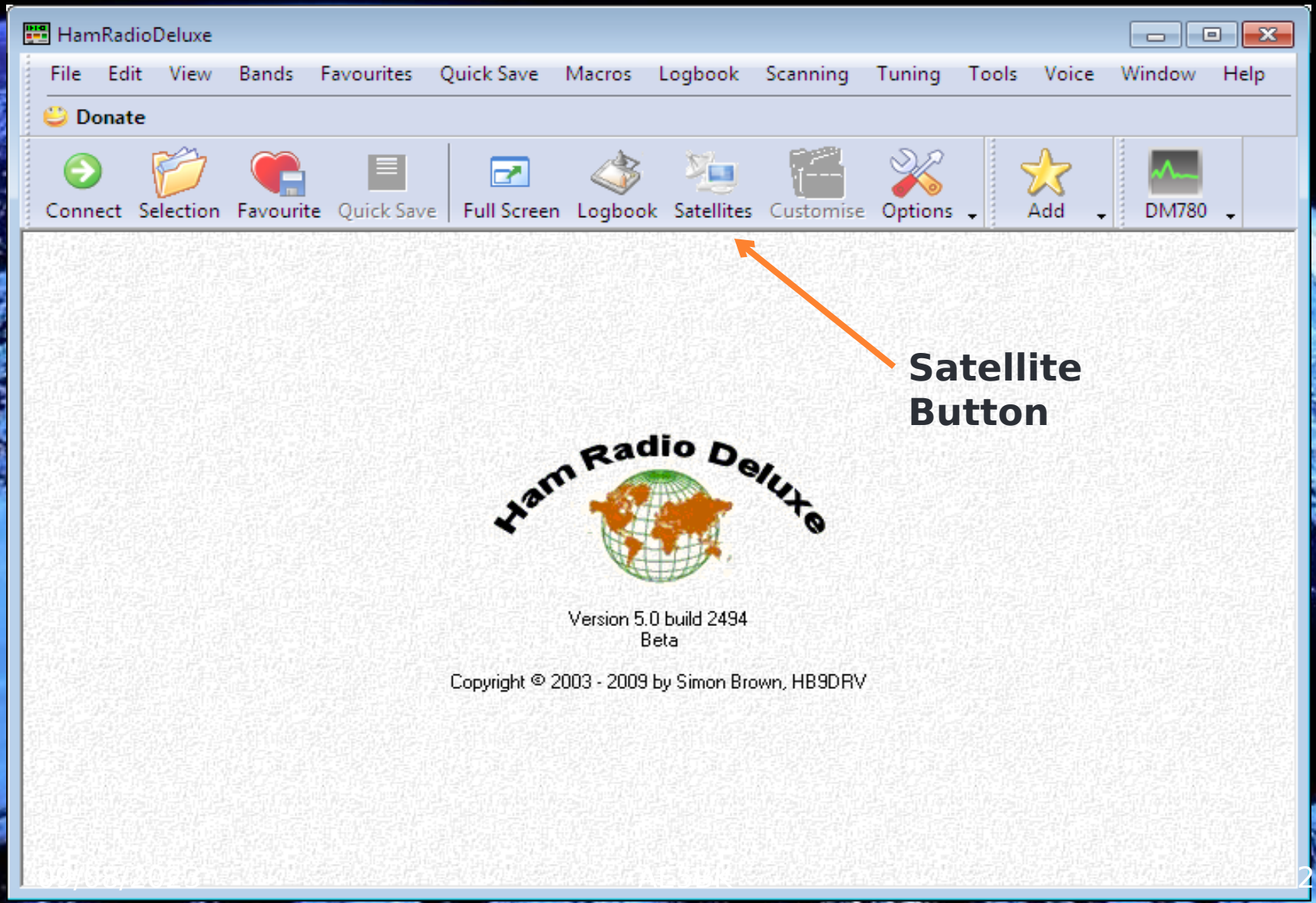
Prediction Setup Tab



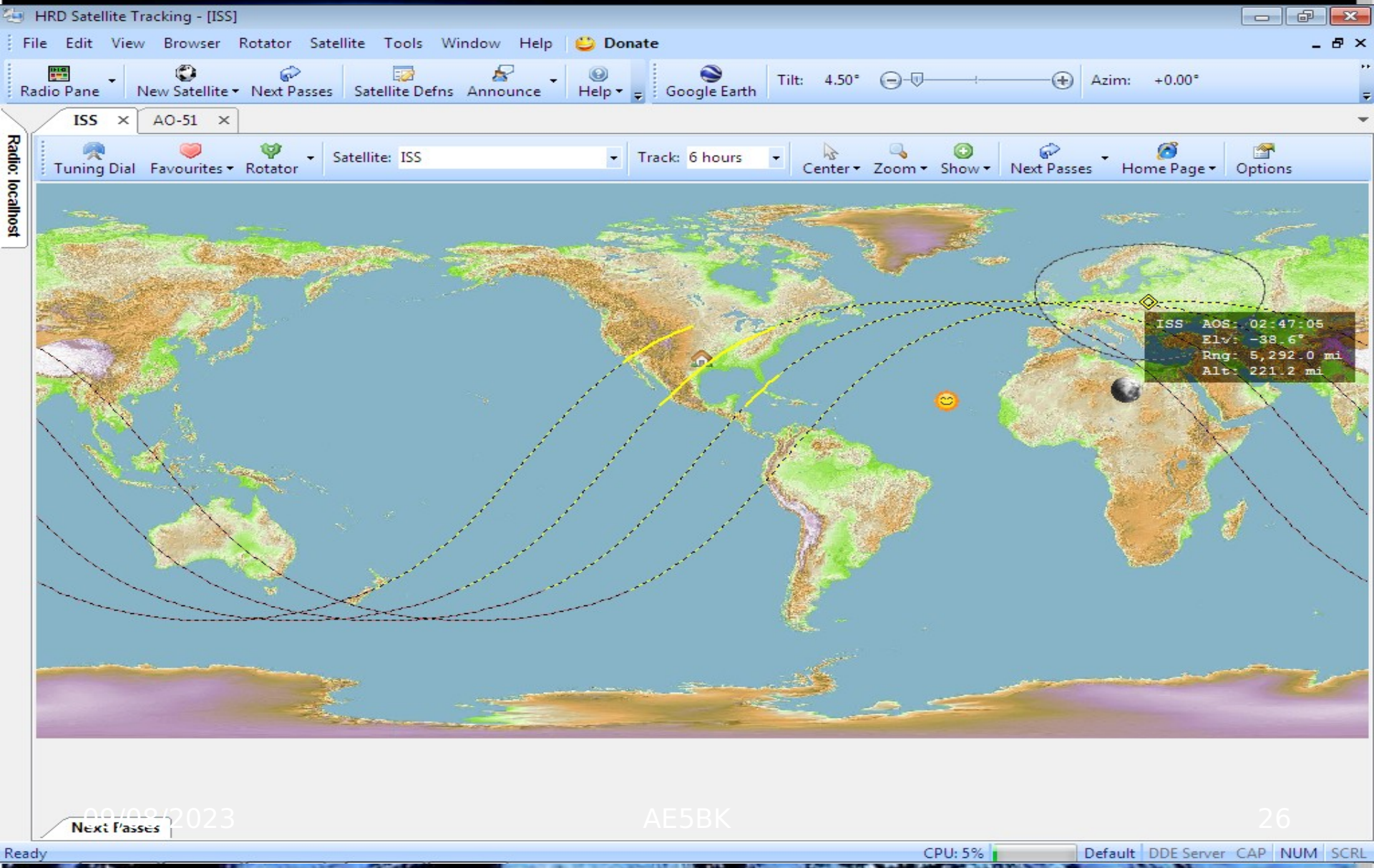
Prediction


Time - LOC Satellite Azm Elv Mag Range S.Azm S.Elv
2010-05-14 23:18:13 ISS 281.2 10.0 ecl 1326 325.4 -30.2
2010-05-14 23:20:29 ISS 231.1 19.9 ecl 891 325.9 -30.5
2010-05-14 23:22:44 ISS 180.9 10.1 ecl 1316 326.5 -30.7
2010-05-14 23:29:06 HOPE-1 (HO-68) 203.2 10.1 ecl 3125 328.0 -31.5
2010-05-14 23:35:12 HOPE-1 (HO-68) 262.4 30.2 ? 1990 329.5 -32.1
Passes
Flares
Predict
Main
Visualisation
Location
Sat/Orbit info
Prediction setup
Prediction
Rotor/Radio
About
?

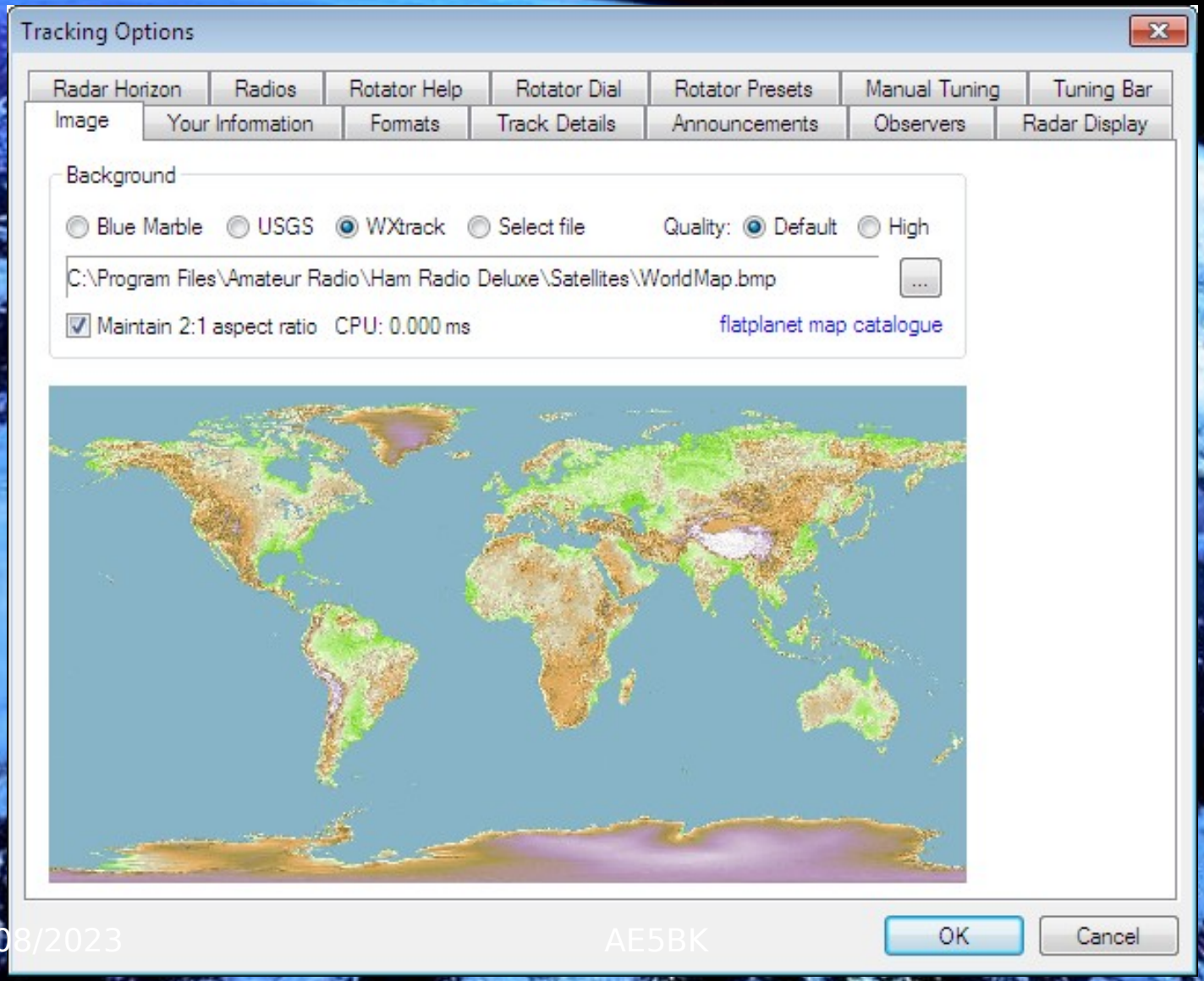
Ham Radio Deluxe



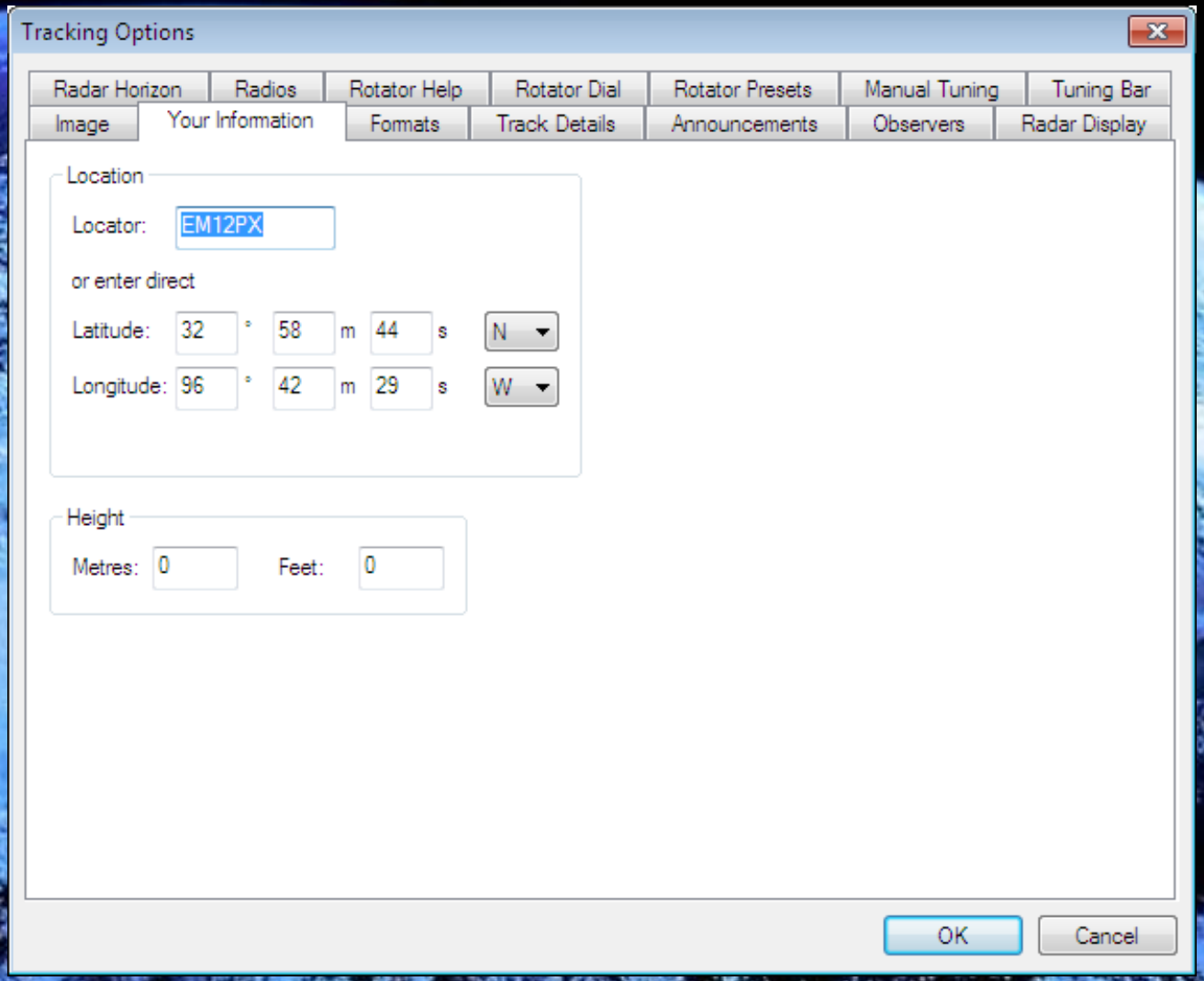
Main Control Panel



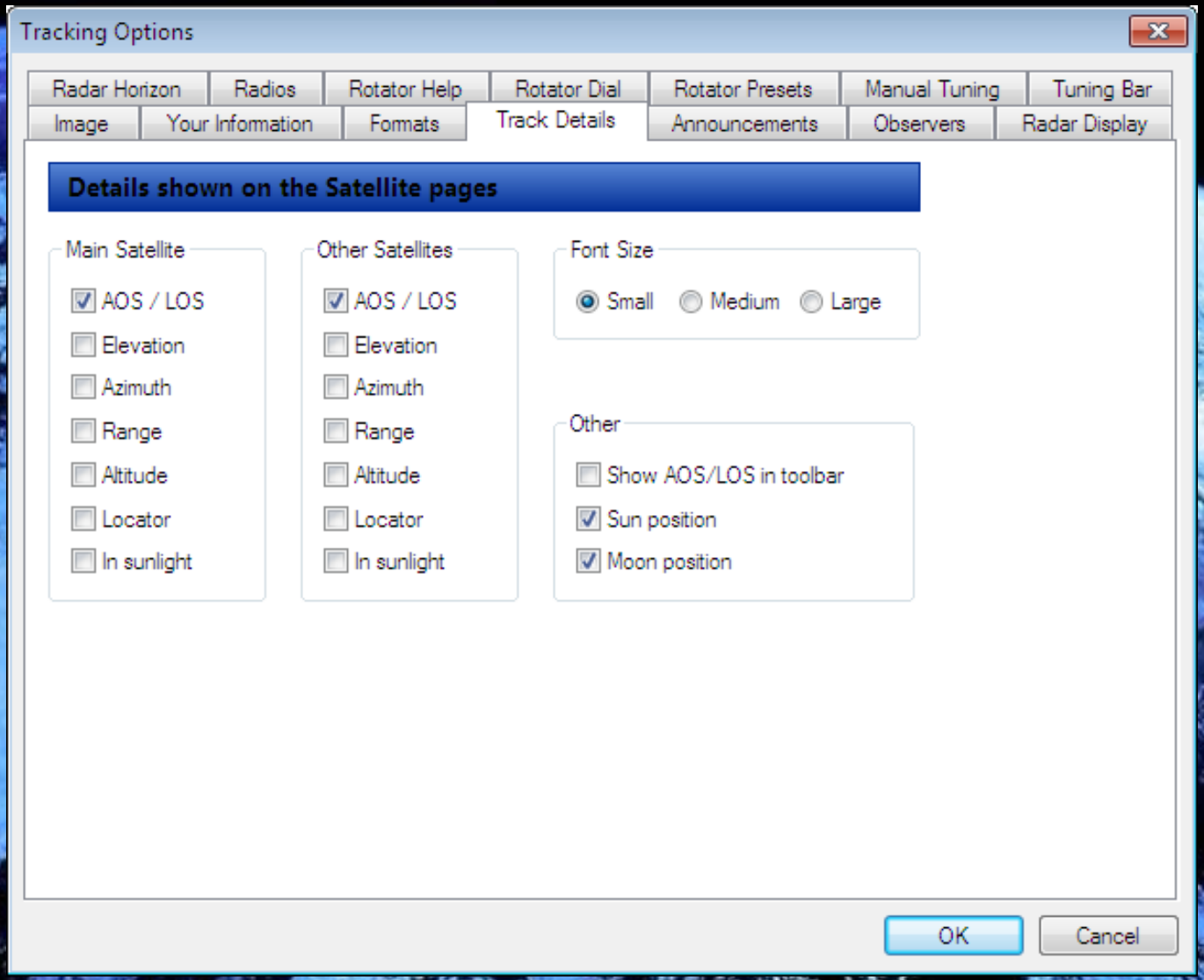
Tracking Options (Image)



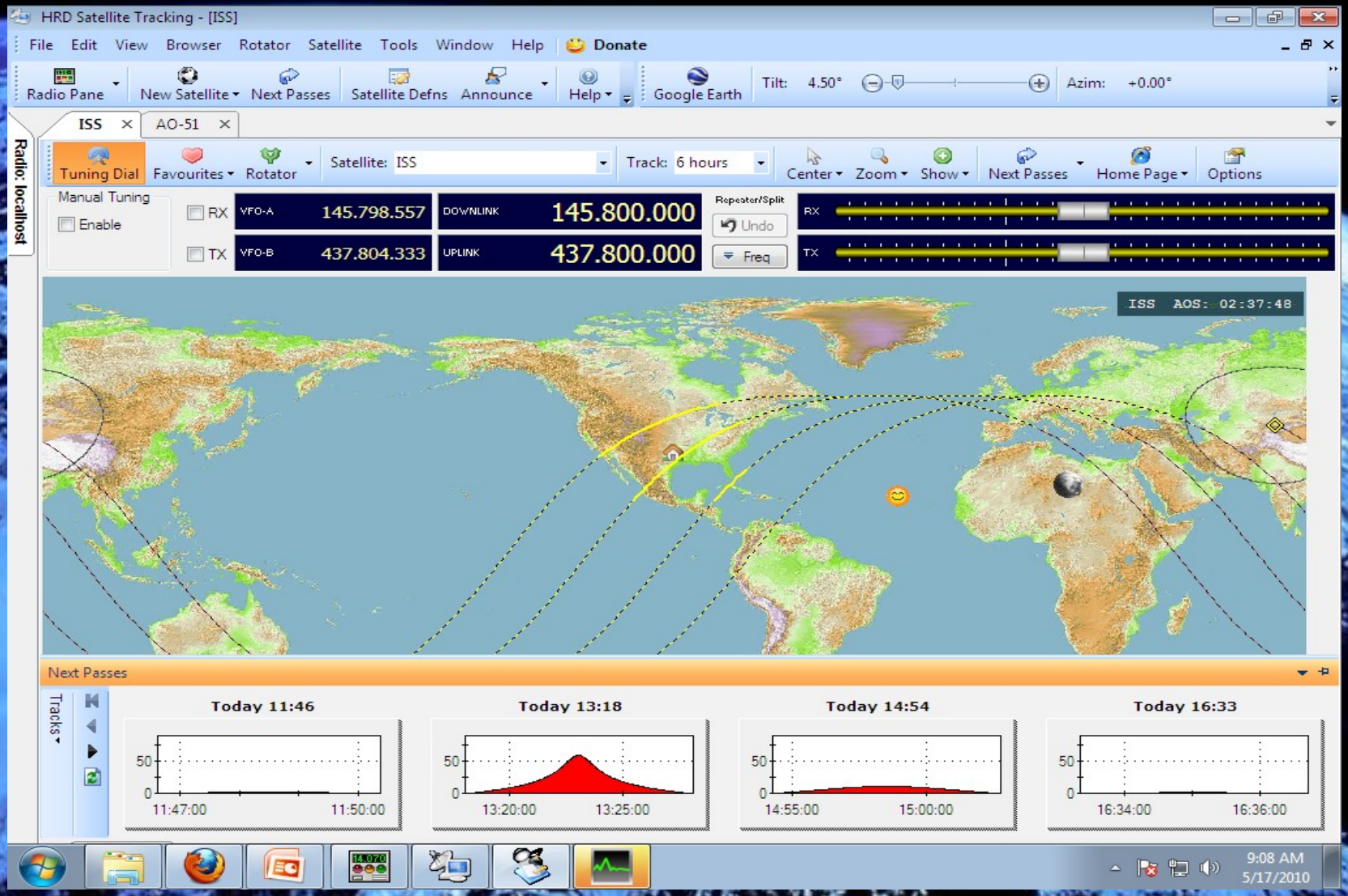
Setting Your Location



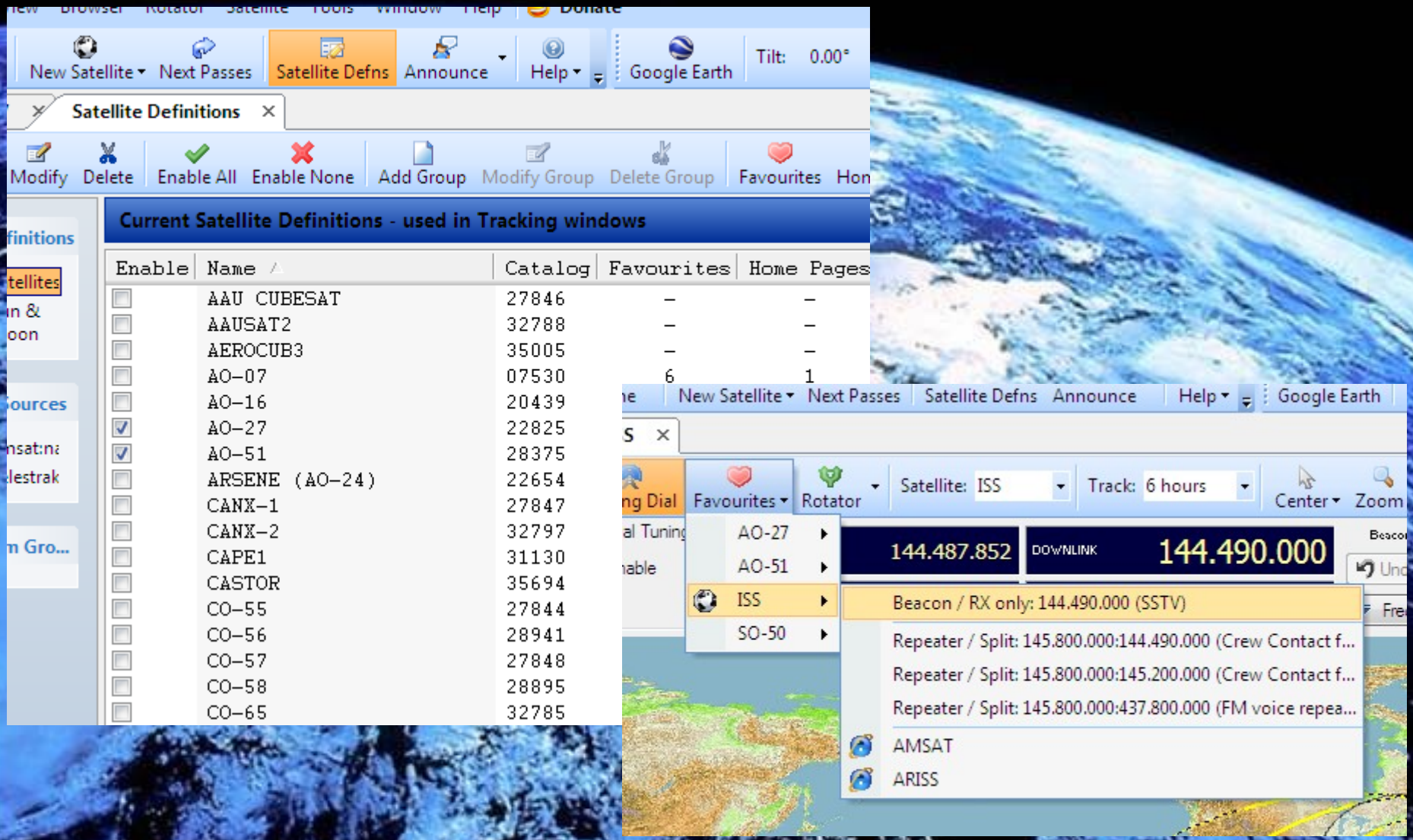
Tracking Details



Tuning Dial


HRD Satellite Tracking - [ISS]
File Edit View Browser Rotator Satellite Tools Window Help Donate
Radio Pane
New Satellite
Next Passes
Satellite Defns
Announce
Help
Google Earth
Tilt: 4.50°
Azim: +0.00°
ISS
AO-51
Radio: localhost
Tuning Dial
Favourites
Rotator
Satellite: ISS
Track: 6 hours
Center
Zoom
Show
Next Passes
Home Page
Options
Manual Tuning
Enable
RX
TX
VFO-A 145.798.557
VFO-B 437.804.333
DOWNLINK 145.800.000
UPLINK 437.800.000
Repeater/Split
Undo
Freq
ISS AOS: 02:37:48
Next Passes
Tracks
Today 11:46
11:47:00
11:50:00
Today 13:18
13:20:00
13:25:00
Today 14:54
14:55:00
15:00:00
Today 16:33
16:34:00
16:36:00
9:08 AM
5/17/2010

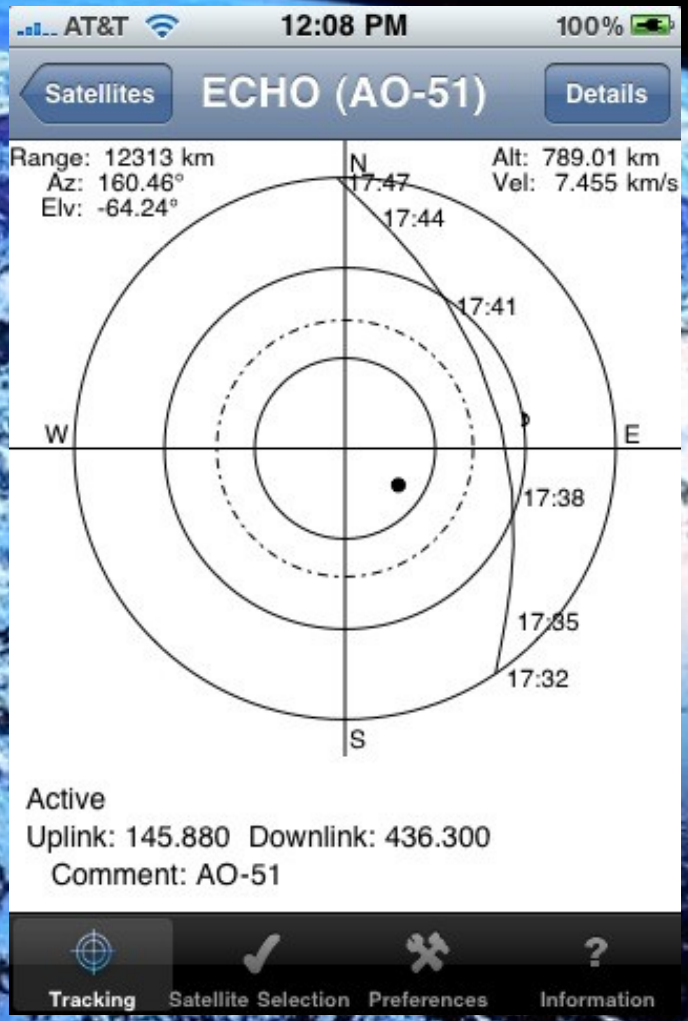
Satellite Defns & Favorites



iPhone/iPod App

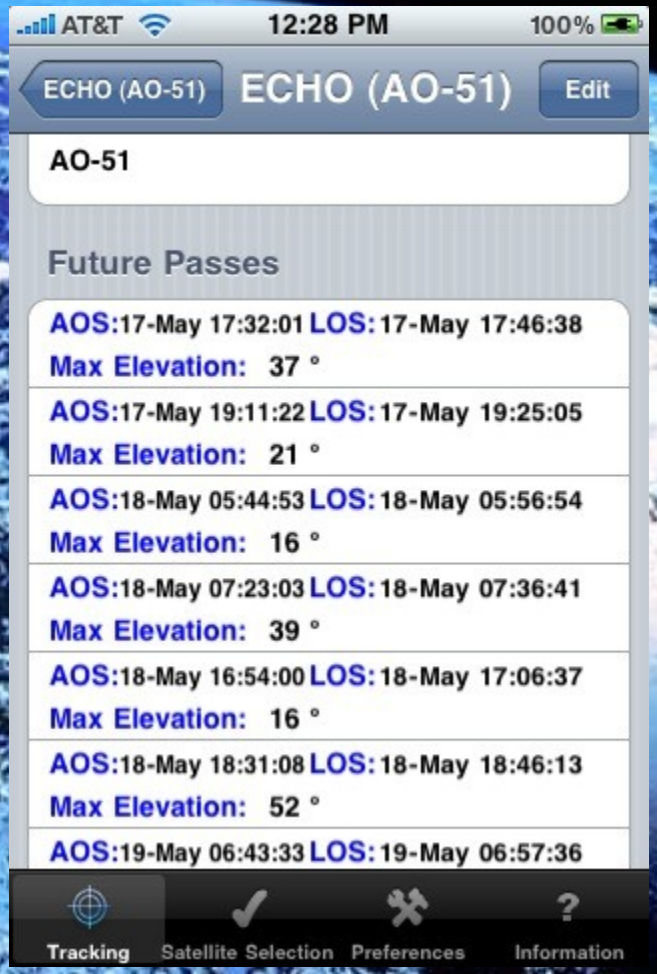
Satellite List

Radar View


AT&T
12:08 PM
100%
Satellites
ECHO (AO-51)
Details
Range: 12313 km
Az: 160.46°
Elv: -64.24°
Alt: 789.01 km
Vel: 7.455 km/s
N
17:47
17:44
17:41
W
E
17:38
17:35
17:32
S
Active
Uplink: 145.880 Downlink: 436.300
Comment: AO-51
Tracking
Satellite Selection
Preferences
Information

Detail Information

Pass Information



What is Next?

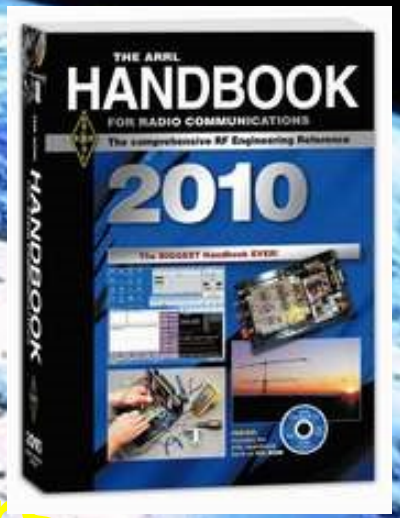
Now that I have every set what do I do now?

- **Go out & listen.**
- **Take a small recorder so that you can replay the session.**
  - **To learn what information is exchanged.**
  - **Who you make contact with. For Logging and QSO cards.**


Most important thing is keep having
FUN

Sources of Information

- Books
- Periodicals
- Internet Sites
- BBS Sites
- AMSAT Area Coordinators
- AMSAT Resource Guide
  (From AMSAT Web Site)
  http://www.amsat.org



General Information Books

- AMSAT: How to Use Amateur Radio Satellites
- AMSAT: Working the Easy Sats
- AMSAT: Mode S The Book
- ARRL: Handbook
- ARRL: Radio Amateur's Satellite Handbook
- ARRL: Satellite Anthology